Status Report to the Technology Strategy Team

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ESTO

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Status

- The purpose of the Annual Report is to
  - Showcase the Earth Science Technology Investment Portfolio
  - Document Project accomplishments/achievements

- Annual Report near completion; Waiting for Inputs from:
  - IIP: 2 Projects — 24 Received
  - ATIP: 10 Projects — 13 Received
  - ATI Directed Components: 4 Projects — 8 Received
  - AIST: 9 Projects* — 13 Received

  - ESTO/ESDIS Prototyping: — Complete
  - NMP: No Inputs Received
  - HPCC/ESS: No Inputs Received

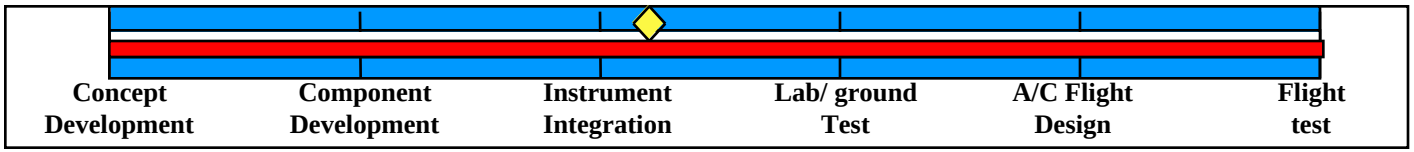
  - * 9 Additional Projects are Contract Pending

Raney, The New Generation of Radar Altimeters: Proof of Concept

Raney, R Keith, Johns Hopkins University, Applied Physics Laboratory

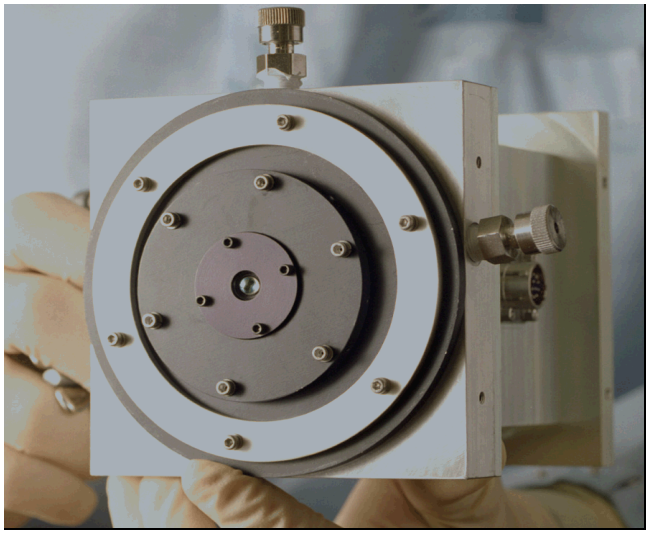
The New Generation of Radar Altimeters: Proof of Concept

- **Objective:**
  - Demonstrate, through airborne field tests, the viability and desirability of an innovative altimeter using the delay/Doppler technique to enhance along-track resolution, precision, and power requirements and the phase monopulse technique to mitigate cross-track slope errors
  - Demonstrate use over open ocean and ice sheets
- **FY 2000 Accomplishments:**
  - All RF chassis complete and installed in the rack
  - Extensive RF testing completed in lab, two noise problems solved
  - Design of 64 element flight array antenna complete
  - Fixed two minor timing problems with mods to A/D converter and chirp generator
  - Completed local test flights in NRL P-3
  - Completed successful demonstraton flights to Greenland



Optical Cryocooler Development

Mr. Gary Mills, Ball Aerospace
bmccomas@ball.com, (303) 939-6109



Optical cryocooler engineering breadboard dewar

Year 2000 Plans

- **Specify and purchase next-generation Ytterbium-doped ZBLAN glass preforms.**
- **Test the new and existing cooling material and elements to identify and quantify the most significant heat production mechanisms.**
- **Analyze dielectric mirror coating and specify new coating.**
- **Fabricate new cooling elements by cutting the ZBLAN glass preform to the required length, polishing the end surfaces to and then applying the dielectric mirror.**
- **Install cooling elements in breadboard and test performance**

Motivation

Optical refrigeration by fluorescence is a new and unique approach to cryocoolers, unrelated to the current state-of the-art such as the Stirling cryocooler. The uniqueness of this invention is that it has the potential to provide *solid state* cooling to liquid nitrogen temperatures, well below 180 K, the approximate limit of thermoelectric coolers. The advantages to the user of this technology are a cooled detector package that is tightly integrated, compact, and light, with very long life (no moving parts), zero vibration, zero electromagnetic interference (EMI), and lower cost

2-micron Laser Transmitter

Dr. Upendra N. Singh, NASA Langley Research Center
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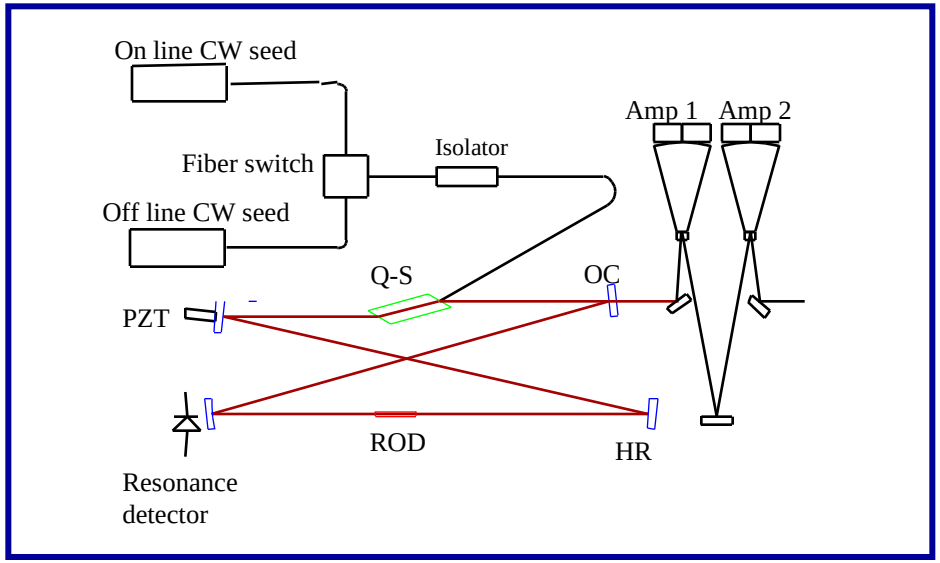


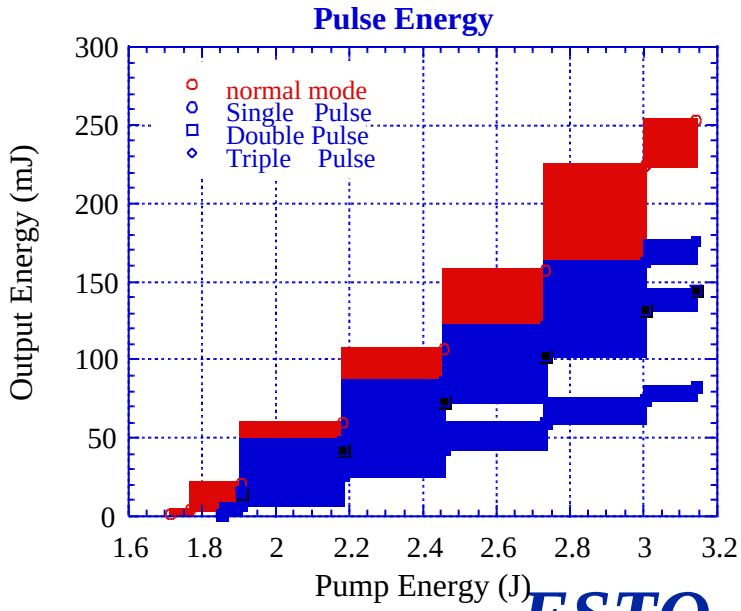
Objective

Develop technologies leading to a conductively-cooled, double-pulsed, diode-pumped 2-micron laser transmitter capable of generating in excess of 500 mJ at 10 Hz pulse repetition frequency and improve the wall plug efficiency to 5% from current state-of- the-art efficiency of less than 1%.

Developments include: (1) a fully conductively cooled laser head including the laser diode arrays to replace the liquid-cooled laser head, (2) technology to double pulse the laser at 400 μs, and (3) to improve the wall plug efficiency, fully conductively cooled end-pump amplifier technologies will be developed.

2000 Accomplishments

- Demonstrated first-ever double pulsing of a 2-micron diode-pumped Ho:Tm:YLF laser system, a key to enabling the development of an eye-safe Differential Absorption Lidar (DIAL) system
- Demonstrated total output energy of 150 mJ per pulse pair under Q-switch operation with an optical to optical efficiency of as high as 4.8%. Compared to a single pulse laser, this demonstrates an improvement of 70% in laser efficiency.



FlightLinux Operating System for Use with Spacecraft Onboard Computers

Patrick H. Stakem, QSS Group Inc.

Description and Objectives

The use of Linux in the flight environment enables an onboard file system; a commonality between flight & ground environments, and a mass of developer experience

FlightLinux to become the onboard soft ware platform of choice.

Approach

Define device drivers for interfaces.
Define real-time requirements.
Select a mission for flight demo.
Develop & fly the software.

Co-I's/Partners

CO-I: Mary Ann Esfandiari, Code 580
Partner: Todd Miller/Code 582

Schedule and Deliverables

Web site: aqua.qssmeds.com/flightlinux
Posix report delivered.
Target architecture report 10/2000
Flight demonstration CY2001

Application/Mission

Flight Demonstration on WIRE or SNAP-1
Applicable to upcoming constellation missions

Science Processing

FY00 Prototypes

1 - Beowulf parallel processor

2 - Problem Solving Environments (PSE) for Scalable Remote Sensing Applications

3 - Auto Class (New)

Synopsis of Objectives

- Augment science processing capabilities by investing in technologies that help Earth Science algorithm development and execution
- Improve science processing system price/performance ratios
- Classification techniques validation

Key Accomplishments

1a - The L1A, Geolocation and L1B algorithms have been integrated into an automated processing system

1b - Algorithms have been modified to run on Direct Broadcast data

2 - AVHRR navigation, earth locate, projection, compositing, calibration, NDVI, SST, snow and ice, classification PSE components completed.

Beowulf Parallel Processor

Comments

- Templates and Format are well established
- Gathering Content before the end of the Fiscal Year continues to be a struggle
- Visuals/Graphics, in general, need improvement
  - Recommend that future solicitations require visuals/graphics as part of the deliverables
  - Encourage current projects to contribute higher resolution visuals/graphics